

**OFFICE OF EMERGENCY SERVICES
URBAN SEARCH & RESCUE
COMMUNICATIONS WORK GROUP**

**RANGE ESTIMATION AND ISOLATION
FIELD GUIDE**

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RANGE ESTIMATION WITH THE FOLLOWING PARAMETERS:

Mountainous/City Environment – High Attenuation

Cable loss is zero Db Antenna gain is zero Db

Antenna SWR is 1:1

Target Antenna is 3’ above Height above Average Terrain

Receiver sensitivity is 1.0 microvolt.

150 MHZ.

4 WATTS ERP		10 WATT ERP		40 WATT ERP	
3’	1.5 MI.		1.7 MI.		2.2 MI.
10’	2.3 MI.		2.7 MI.		3.4 MI.
20’	2.9 MI.		3.4 MI.		4.4 MI.
40’	3.7 MI.		4.4 MI.		5.6 MI.
50’	4.0 MI.		4.8 MI.		6.1 MI.
100’	5.2 MI.		6.1 MI.		7.8 MI.
150’	6.0 MI.		7.1 MI.		9.1 MI.
200’	6.7 MI.		7.8 MI.		10.1 MI.
500’	9.2 MI.		10.9 MI.		13.1 MI.
1000’	11.9 MI.		13.1 MI.		17.9 MI.
2000’	15.2 MI.		17.9 MI.		21.9 MI.
5000’	20.5 MI.		23.3 MI.		28.4 MI.

450 MHZ.

4 WATTS ERP		10 WATT ERP		40 WATT ERP	
3’	1.0 MI.		1.2 MI.		1.5 MI.
10’	1.5 MI.		1.8 MI.		2.3 MI.
20’	2.0 MI.		2.3 MI.		2.9 MI.
40’	2.5 MI.		2.8 MI.		3.8 MI.
50’	2.8 MI.		3.2 MI.		4.2 MI.
100’	3.5 MI.		4.2 MI.		5.3 MI.
150’	4.1 MI.		4.8 MI.		6.2 MI.
200’	4.5 MI.		5.3 MI.		6.8 MI.
500’	6.3 MI.		7.4 MI.		9.5 MI.
1000’	8.1 MI.		9.5 MI.		12.2 MI.
2000’	10.3 MI.		12.2 MI.		14.9 MI.
5000’	13.9 MI.		15.8 MI.		19.3 MI.

Indicated above are the approximate minimum ranges based on a mountainous or terrain with tall buildings (level 5).

Level 1: Sea water

Level 2: Flat terrain

Level 3: Woods or suburban area

Level 4: Large hills, downtown area.

To go from 5 to 4, add apx. 12% avg. improved range

To go from 5 to 3, add apx. 22% avg. improved range

To go from 5 to 2, add apx. 29% avg. improved range

To go from 5 to 1, add apx. 33% avg. improved range

ISOLATION REQUIREMENTS FOR VERTICAL AND HORIZONTAL SEPARATION

450 MHZ.	at 4 watts	at .25 microvolt	sensitivity
SEPARATION IN MHZ.	ISOLATION	VERTICAL	HORIZONTAL
1.0	95.5 dB	155'	
2.0	83.5 dB	77'	
3.0	74.2 dB	44'	
4.0	67.6 dB	30'	
5.0	62.5 dB	22'	
6.0	58.3 dB	17'	208'
7.0	54.8 dB	14'	139'
8.0	51.8 dB	11'	97'
9.0	49.1 dB	10'	71'
10.0	46.6 dB	8'	54'
11.0	45.7 dB	8'	48'
12.0	44.8 dB	7'	43'
13.0	44.1 dB	7'	40'
14.0	43.3 dB	7'	36'
15.0	42.6 dB	6'	34'

450 MHZ.	at 10 watts	at .25 microvolt	sensitivity
SEPARATION IN MHZ.	ISOLATION	VERTICAL	HORIZONTAL
1.0	99.4 dB	197'	
2.0	87.5 dB	97'	
3.0	78.2 dB	56'	
4.0	71.6 dB	38'	
5.0	66.5 dB	28'	
6.0	62.3 dB	22'	
7.0	58.8 dB	17'	219'
8.0	55.7 dB	14'	154'
9.0	53.1 dB	12'	113'
10.0	50.6 dB	11'	85'
11.0	49.7 dB	10'	76'
12.0	48.8 dB	9'	69'
13.0	48.1 dB	9'	63'
14.0	47.3 dB	9'	58'
15.0	46.6 dB	8'	54'

ISOLATION REQUIREMENTS FOR VERTICAL AND HORIZONTAL SEPARATION

450 MHZ.	at 40 watts	at .25 microvolt	sensitivity
SEPARATION IN MHZ.	ISOLATION	VERTICAL	HORIZONTAL
1.0	105.5 dB	281'	
2.0	93.6 dB	139'	
3.0	84.3 dB	80'	
4.0	77.7 dB	54'	
5.0	72.6 dB	40'	
6.0	68.3 dB	31'	
7.0	64.8 dB	25'	
8.0	61.8 dB	21'	
9.0	59.1 dB	18'	227'
10.0	56.7 dB	15'	170'
11.0	55.7 dB	14'	153'
12.0	54.9 dB	14'	139'
13.0	54.0 dB	13'	127'
14.0	53.3 dB	12'	116'
15.0	52.7 dB	12'	108'

ISOLATION REQUIREMENTS FOR VERTICAL AND HORIZONTAL SEPARATION

160 MHZ.	at 5 watts	at .25 microvolt	sensitivity
SEPARATION IN MHZ.	ISOLATION	VERTICAL	HORIZONTAL
1.0	75.2 dB	101'	
2.0	67.2 dB	63'	
3.0	57.5 dB	36'	
4.0	50.7 dB	24'	
5.0	45.4 dB	18'	147'
6.0	41.1 dB	14'	89'
7.0	37.4 dB	11'	59'
8.0	37.2 dB	9'	41'
9.0	31.5 dB	8'	29'
10.0	28.6 dB	6'	21'
11.0	27.7 dB	6'	19'
12.0	26.9 dB	6'	17'
13.0	26.1 dB	6'	16'
14.0	25.5 dB	5'	14'
15.0	24.8 dB	5'	13'

160 MHZ.	at 10 watts	at .25 microvolt	sensitivity
SEPARATION IN MHZ.	ISOLATION	VERTICAL	HORIZONTAL
1.0	78.2 dB	120'	
2.0	70.3 dB	76'	
3.0	60.6 dB	43'	
4.0	53.7 dB	29'	
5.0	48.4 dB	21'	
6.0	44.1 dB	16'	127'
7.0	40.4 dB	13'	83'
8.0	37.3 dB	11'	58'
9.0	34.5 dB	9'	42'
10.0	31.6 dB	8'	30'
11.0	30.7 dB	7'	27'
12.0	29.9 dB	7'	24'
13.0	29.2 dB	7'	22'
14.0	28.5 dB	6'	21'
15.0	27.8 dB	6'	19'

ISOLATION REQUIREMENTS FOR VERTICAL AND HORIZONTAL SEPARATION

160 MHZ.	at 40 watts	at .25 microvolt	sensitivity
SEPARATION IN MHZ.	ISOLATION	VERTICAL	HORIZONTAL
1.0	84.2 dB	170'	
2.0	76.3 dB	107'	
3.0	66.6 dB	61'	
4.0	59.7 dB	41'	
5.0	54.4 dB	30'	
6.0	50.1 dB	23'	254'
7.0	46.5 dB	19'	167'
8.0	43.3 dB	16'	116'
9.0	40.5 dB	13'	84'
10.0	37.7 dB	11'	60'
11.0	36.8 dB	11'	54'
12.0	35.9 dB	10'	49'
13.0	35.2 dB	10'	45'
14.0	34.5 dB	9'	42'
15.0	33.9 dB	9'	39'